terrestrial and semi-aquatic species. They are wanting, or greatly reduced, in the strictly aquatic and strictly terrestrial forms. The author believes that these bladders are receptacles for liquid stored up for the use of the animal, but he could not confirm the statement of earlier observers that the fluid was water taken in through the cloaca.

G. H. P.

Osteology of the Percesoces. — Professor Edwin Chapin Starks, now of the University of Washington, gives in the *Proceedings of the United States National Museum*, pp. 1–10, a valuable study of the osteology of the suborder of fishes known as Percesoces. He finds the members of this group less closely related than would be supposed from their resemblance in external characters, although really allied. The Sphyrænidæ (Barracudas) stand as a group opposed to the remaining families Mugilidæ (mullets) and Atherinidæ (silversides: Pesce-Rey). The osteology of a typical member of each family is given, with illustrative plates by the skillful hand of Mrs. Starks, who, as Chloe Lesley, was formerly the artist of the Hopkins Laboratory at Stanford University.

In all these species the so-called coronoid bone is present, but Professor Starks doubts its homology with the coronoid bone of reptiles, and thinks that the systematists have made too much of it and the anatomists not enough. It has little systematic value, for it is present in many unrelated genera (catfish, sucker, striped bass, bluefish, cod), while, on the other hand, it has been generally overlooked by anatomists as a structure present in fishes.

Starks on the Relationships of Dinolestes. — In the *Proceedings of the United States National Museum*, Professor Edwin Chapin Starks undertakes to settle the vexed question of the affinities of the Australian fish, *Dinolestes lewini*, by a study of its osteology.

In spite of its resemblance to the Barracuda and the Pesce-Rey, he finds no evidence of close affinity and places Dinolestes among the true percoids. It is probably allied to Sphyrænops and Scombrops and belongs to the family of Cheilodipteridæ.

The Peripheral Nervous System of Bony Fishes. — The cranial and first spinal nerves of the common silverside, Menidia, have been investigated by C. J. Herrick.[1] Four components are now generally recognized in the spinal nerves of vertebrates: (1) somatic motor

[1] Herrick, C. J. The Peripheral Nervous System of the Bony Fishes, *Bull. U. S. Fish Comm., 1898.* pp. 315–320. 1899.

fibres derived from the ventral horn cells of the cord and distributed to the striated body musculature; (2) somatic sensory or general cutaneous fibres terminating in the dorsal horn and supplying the skin of the body; (3) visceral motor fibres supposed to pass from the lateral horn outward by both dorsal and lateral roots; and (4) visceral sensory fibres passing in through the dorsal roots only. In the cranial nerves, in addition to these four components, a fifth, the acustico-lateral, can be distinguished in connection with the ear and lateral line organs. No cranial nerve contains all these components, and there is an obvious tendency towards the concentration of the fibres of each component, so as to form a single system with a common center in the medulla.

The composition of the various cranial nerves is as follows. The hypoglossal is composed of somatic motor fibres and passes out as the first member of the first spinal complex. The spinal accessory is made up of visceral motor fibres and passes out with the vagus to innervate the trapezius muscle. The vagus is in the main formed of visceral motor and visceral sensory fibres, together with a few somatic sensory and acustico-lateral fibres. The glossopharyngeal contains only visceral motor and visceral sensory fibres. The auditory is exclusively acustico-lateral. The facial is composed of visceral motor, visceral sensory, and acustico-lateral fibres. The abducens is wholly somatic motor. The trigeminal is visceral motor and somatic sensory. The trochlear and oculomotor are both somatic motor. The optic and olfactory nerves have not as yet been placed in any category.

G. H. P.

Reactions of Entomostraca to Light. — R. M. Yerkes[1] has studied the reactions of two entomostracans, Simocephalus and Cyclops, to differences in light intensity, photopathy. In the experiments the influence of the direction of the light was eliminated and the animals were subjected to light of graduated intensity. Simocephalus moved into regions of greater intensity of light, *i.e.*, was positively photopathic; and the amount of positive movement varied, within certain limits, directly with the intensity of the light. Diffuse daylight caused a greater positive response than direct sunlight. Cyclops proved to be not photopathic. It was also shown that Simocephalus preferred the orange and yellow portion of the spectrum of illuminating gas, but the author concludes that this is a response to inten-

[1] Yerkes, R. M. Reactions of Entomostraca to Stimulation by Light, *Amer. Journ. Physiol.*, vol. iii, pp. 157–182. November, 1899.